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Investigating the Factors Influencing Students' Acceptance of Mobile Learning: The Cave Hill Campus Experience

Grace-Anne Jackman

School of Education, University of the West Indies, Cave Hill Campus, Barbados

The unprecedented growth in the mobile computing market is creating opportunities within the higher education sector. However, before merging these new technologies with traditional methods, it is critical that the factors that are likely to affect the success of m-learning initiatives be identified. This study uses the Unified Theory of Acceptance and Use of Technology (UTAUT) model to determine the critical factors influencing undergraduate students' acceptance of m-learning technologies. Six hundred undergraduates at the Cave Hill Campus of the University of the West Indies in Barbados participated in the study. The data were analysed using multiple linear regression to determine the effect of four UTAUT constructs on behavioural intentions, moderated by age and gender. The findings revealed that whereas the factors performance expectancy, effort expectancy, and facilitating conditions were significant, positive, determinants of students' intentions to adopt m-learning technologies, social influence had no significant effect in this Caribbean context. This study should be of interest to higher institutions desirous of introducing m-learning initiatives, particularly in developing countries.

Keywords: Technology acceptance, UTAUT, Mobile learning, Caribbean, Higher Education, Developing countries.

Background

The 21st century has seen the growth of mobile computing, particularly in the area of mobile-learning (m-learning) technologies. Research conducted by the Global System for Mobile Communications Association (GSMA) predicts unprecedented growth in the global mobile market, with the number global mobile connections expected to reach 9.7 billion by 2017. In addition, an expected reach of 3.9 billion global mobile subscribers means that over half of the world's population will have access to mobile devices by 2017 (http://www.gsmamobileeconomy.com/). The increased accessibility to mobile networks coupled with a decrease in the cost of mobile devices has significant implications for transforming the educational instructional environment, particularly in the area of m-learning. M-learning, the successor to e-learning can be informally defined as e-learning via the use of mobile devices and wireless transmission (Hoppe et al., 2003). These technologies run the gamete of handheld devices: from gaming consoles and MP3 players to mobile phones, palmtops and tablet PCs – all of which have functionalities useful for sending, receiving and interacting with educational

*Email: grace-anne.jackman@cavehill.uwi.edu

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content. While e-learning applications still remain the popular mode of choice for integrating technology into teaching practice, m-technologies offer the added advantage of ubiquitous, anytime m-learning applications. This means that the learning environment is no longer restricted within the bounds of the classroom because students can access and engage with course material anytime and from anywhere (Peng et al., 2009). The opportunity to learn "on-the-go" helps to drive the shift from the traditional teacher-centred to a learner-centred, constructivist paradigm, which means that students are given the opportunity to be more in charge of their own learning (Liu, Han, & Li, 2010; Peng et al., 2009; Penuel, 2006). The shift can be easily facilitated in an m-learning environment, since students can communicate with instructors and peers to share discussions, experiments, images, graphics, interactive games and self-constructed tests using the collaborative capabilities of their mobile devices. This creates myriad opportunities for the developers of m-learning tools, applications, and educational content to provide support to teachers with the delivery of lectures and preparation of class tests, assignments, project-based work, on-line forums etc. (Premadasa & Meegama, 2013). Even in these times of budgetary constraints, higher education institutions continue to invest in technology. Therefore, it is important that we seek to understand the main factors influencing the acceptance and use of these emerging educational technologies. This is particularly relevant to the Caribbean region where the setting up of e- learning systems can be accompanied by technical or infrastructural challenges (Thomas, Singh, and Gaffar, 2013). The identification of the factors that influence user acceptance can help in ensuring successful delivery of an enhanced higher education experience.

However, even with the increased use of and demand for mobile technologies, students and educators are yet to fully embrace and accept these m-learning technologies as viable options for their learning environments. Furthermore, the migration from an e-learning to an m-learning environment is not without challenges: both from a technical and support resources perspective, for example, low bandwidth as well as hardware and software limitations (Cmuk, 2007). Therefore, institutions may be reluctant to adopt this technology without having the necessary facilitating conditions and resources in place. As a result, it is important that students' perceptions and attitudes be considered when assessing the viability of new initiatives such as m-learning (Apostolou et al., 2009).

The Learning Resource Centre (LRC) of the Cave Hill Campus has been charged with the responsibility of investing in and delivering technological services and solutions which can be used to enhance teaching and learning among faculty and students (http://cavehill.uwi.edu/lrc/). If m-learning is to be viewed as a viable instructional tool by the LRC, it is critical that the factors that may either inhibit or encourage the acceptance of this technology by the student body be investigated. This study used the UTAUT instrument to explore the level of acceptance of m-learning technologies among undergraduate students of the Cave Hill Campus and focused on the following two research questions:

1. Do the UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) positively influence students' intentions to adopt m-learning?
2. Do age and gender significantly moderate the influence of the UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) on students' behavioural intentions to adopt m-learning?

Literature Review

Sharples, Taylor, and Vavoula (2007) define m-learning as "the processes (both personal and public) of coming to know through exploration and conversations across multiple contexts among people and personal interactive technologies" (p. 225). In a similar vein, O'Malley et al. (2003) define it as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies." Both of these definitions include the two distinguishing features of m-learning that differentiates it from e-learning - mobility and ubiquity. Mobility refers to 'convenience, expediency and immediacy' (Kynäslahti, 2003) while ubiquity refers to on-demand computing power with which users can access commuting technologies whenever and wherever they are needed (Peng et al, 2009). This "anytime, anywhere" advantage offers significant learning opportunities to students and instructors in higher education. Several of these institutions have already started to integrate m-learning, albeit at different levels of implementation. For example, universities such as Abilene Christian University, Purdue, and Dukehave introduced m-learning courses into their curriculum (Pollara, 2011), in Japan, Osaka Jogakuin College provides mobile learning devices to their students (Donaldson, 2011) , universities such as Princeton University, Ohio State University, and Stanford University have developed their own mobile apps to communicate information such as course materials, grades, campus news and sporting scores (Fraga, 2012), while in Canada, institutions such as Algonquin College, Durham College and the University of Ontario Institute of Technology provide dedicated spaces and m- learning resources on campus where students can use their mobile devices in a collaborative learning environment (Ally & Palalas, 2011).

In synthesizing research results from institutions that had adopted and integrated wireless mobile computing into their learning environments, Penuel (2006) found several factors motivating this migration. Many of these m-learning initiatives were prompted by a desire to improve the academic success of students, to reduce the digital divide by increasing the equity of access to technology, to prepare students to function more effectively in competitive work environments and to transform the instructive model from a traditional teacher-centred approach to a more student-centred approach (Bonifaz & Zucker, 2004; Penuel, 2006). While these mobile technologies may never completely replace all face-to-face classroom interaction, the integration of these technologies will allow for easier facilitation of blended courses combining offline and online learning with mobile devices. Even with all the potential advantages, students may be hesitant about accepting m-learning. Therefore, it is critical to develop an understanding of the factors that influence the adopting and use of m-learning in higher education institutions.

Technology Acceptance Theories

Technology acceptance models can be used to assess and gauge students' behavioural intentions and determine the factors which most positively influence students' likelihood to adopt new technologies such as m-learning (Apostolou et al., 2009). Since the 1980s several information technology acceptance theories have been proposed and used to explain technology adoption behaviour and its antecedents (Van Schaik, 2009). These include the Theory of Planned Behaviour (TPB) (Ajzen 1985) derived from social psychology, the Technology Acceptance Model (TAM) (Davis, 1986, 1989; Davis et al. 1989), the Technology, Organization, and Environment framework (TOE) (Tornatzky & Fleischer, 1990), and the Diffusion on Innovation model (DOI) (Rogers, 1995). These models have gained popularity and have been used in several studies exploring technology adoption practices; particularly in Western developed

countries (Davies & Graff, 2005; Huang et al., 2007; McCoy et al., 2007; Schepers & Wetzels, 2007; Straub, Keil, & Benner, 1997; Straub, Loch, & Hill, 2001; Wang, Wu, & Wang, 2009; Wills, El-Gayar, & Bennett, 2008). However, there is a corresponding dearth of research on technology acceptance in developing countries (Anandarajan et al., 2000; Al-Ghahtani, 2003; Iqbal & Qureshi, 2012; Maldonado et al., 2011). The situation is even more dire with respect to empirical evidence on the technology adoption practices of students within the Caribbean.

The UTAUT Model

A more recent and frequently used model is the Unified Theory of Acceptance and Use of Technology (UTAUT), which was proposed by Venkatesh, Morris and Davis (2003) and was formulated by integrating components from eight theoretical models (Van Schaik, 2009). One reason for its popularity is that this model has been shown to be more accurately predictive of technology acceptance; accounting for about 70 per cent of the variance in behavioural intentions when compared with previous models such as the Technology Acceptance Model (TAM) which accounted for a maximum of 40 per cent of the variance in behavioural intentions (Alrawashdeh & Al-Mahadeen, 2013; Venkatesh et al., 2003). The UTAUT model focuses on four key constructs; three of which are based on intentional beliefs (i.e., performance expectancy, effort expectancy, and social influence) and the fourth which examines the extent to which external conditions affect the individual (i.e., facilitating conditions). According to the model, these constructs are hypothesized to positively affect other constructs such as behavioural intentions, shown to be an important predictor of technology adoption (Van Schaik, 2009; Venkatesh et al., 2003). The definitions of each of the four key UTAUT constructs as well as a summary of findings from previous research are given below.

- **Performance expectancy –** The extent to which an individual believes that using an information system will help him or her to attain benefits in job performance (Venkatesh et al., 2003). In the m-learning context, this means that students believe they will not only find m-learning technologies useful but that as a result they will accomplish their tasks in a more timely, effective manner. Previous research has shown performance expectancy to be the strongest predictor of behavioural intentions (Morris &Venkatesh, 2000; Venkatesh& Morris, 2000; Wang,Wu& Wang, 2009).
- **Effort expectancy –** The degree of ease which individuals associate with using the new system (Venkatesh et al., 2003). In this context, this is related to the perceived ease of use of the m-learning technology and its associated features.
- **Social influence –**The extent to which individuals perceive that important others believe that they should use the new system (Venkatesh et al., 2003). In this context, this relates to the impact influential persons such as friends or University lecturers have on a student's propensity to adopt the m-learning technologies. While the role of social influence has been shown to weaken over time; it is still deemed to be an influential factor in the early phases of technology adoption (Venkatesh& Davis, 2000).
- **Facilitating conditions** - The degree to which an individual believes that organizational and technical infrastructure exist to support use of the system. In this case, this factor measures the extent to which students believe both the university and the host country provide the necessary support for m-learning (Venkatesh et al., 2003). This construct also measures whether students believe they have the knowledge and the resources necessary to use m-learning.

In the UTAUT model, the variables of age, gender, voluntariness of use and experience have been hypothesized to moderate the effects of the relationships between the four key constructs and behavioural intentions (Venkatesh & Davis, 2000; Venkatesh et. al., 2003). With respect to age and gender, previous research (Morris & Venkatesh, 2000; Venkatesh & Morris, 2000; Wang, Wu, & Wang, 2009) has shown the following:

- Age and gender moderate the influence of performance expectancy on behavioural intentions with the effect being stronger for males and younger individuals.
- The effect of effort expectancy on behavioural intentions is moderated by gender and age; with the effect being stronger for women, particularly younger women.
- The influence of social influence on behavioural intentions is moderated by gender and age; such that the effect is stronger for women.
- The influence of facilitating conditions on behavioural intentions is moderated by age; with the effect being stronger for older users.

Based on the UTAUT theoretical framework, this research explored whether the four key factors performance expectancy, effort expectancy, social influence and facilitating conditions were significant predictors of students' behavioural intentions to adopt m-learning. In addition, the moderating effects of age and gender were also considered. It must be noted that while the original UTAUT model also included voluntariness of use and experience as moderating variables, these variables were not included in this study. Within the current context, the technology is still in its embryonic stages and m-learning applications have not yet been formally integrated as part of the courses. Therefore, at this early stage, there is no compelling argument for the inclusion of voluntariness of use and user experience with the technology. The model used in this study is shown in Figure 1.

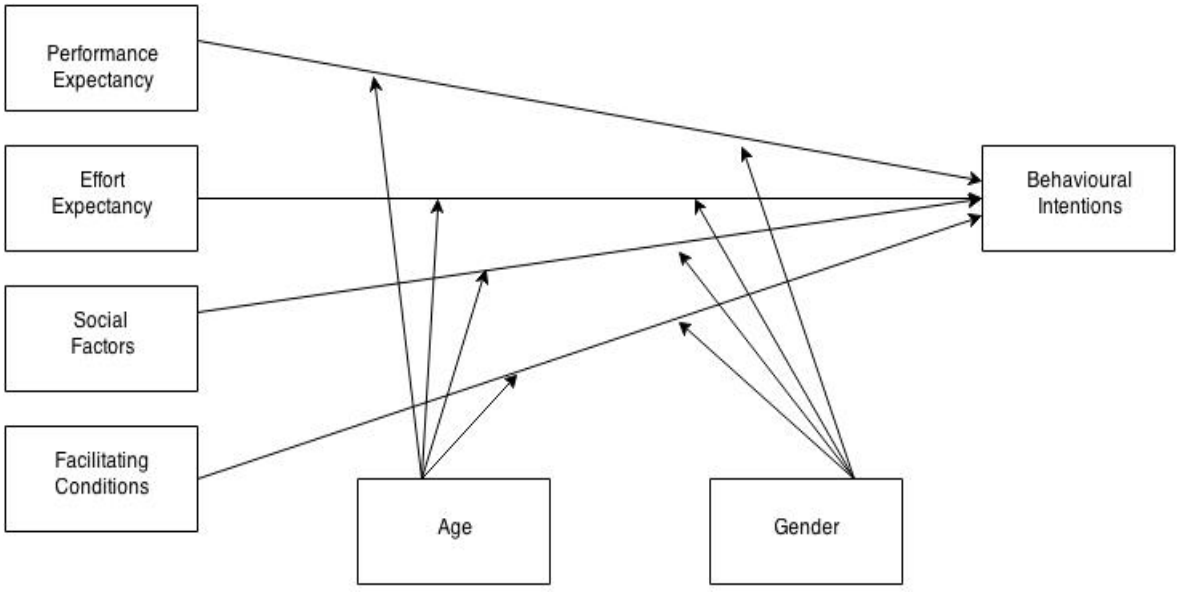

Figure 1. Research Model

Research Methodology

Sample

The data for this study were collected using a web-based survey instrument which was made available to all undergraduate students during the period October to December, 2012. Participation in the study was completely voluntary and no identifying information was required on the survey. A total of six hundred completed questionnaires were received, representing 8% of the total undergraduate population of 7,529 at the Cave Hill Campus.

Instruments

The questionnaire used in this study consisted of three sections and was based on the constructs defined in the UTAUT model (Venkatesh et al., 2003). Section I was designed to capture the demographic profile of the sample and included items such as students' sex, age and year of undergraduate programme. Section II focused on students' mobile device ownership and their usage of these technologies. Section III contained 18 questions based on the five UTAUT constructs. Performance expectancy (e.g. Mobile technologies are useful in education in general), effort expectancy (e.g., Mobile technologies are easy to use), social influence (e.g., People who influence my behavior think I should use mobile technologies for learning.), facilitating conditions (e.g., In general, my University campus has support for m-learning), and behavioural intentions (e.g., I intend to use m-learning strategies in the next semester) were all measured using a five-point agreement Likert scale (from 1 - strongly disagree to 5 - strongly agree).

Data Analysis

The collected data were analysed using SPSS V 19. Descriptive analyses such as frequencies, means, standard deviations, and correlations were run to examine sample profile and to determine the extent of relationships among the variables. Secondly, a multiple linear regression analysis was conducted to explore the research questions posed regarding the extent to which the four constructs explain the variance in students' behavioural intentions to adopt m-learning. This relationship was examined with and without the inclusion of the proposed mediator variables age and gender.

Item Reliability

The reliabilities of the five scales all exceeded the minimum recommended Cronbach's value of 0.70 (Hair et al., 1998; Nunnally, 1978) indicating adequate internal consistency. The construct performance expectancy consisted of four items ($\alpha = 0.85$), effort expectancy consisted of three items ($\alpha = 0.88$), social influence consisted of three items ($\alpha = 0.72$), facilitating conditions consisted of five items ($\alpha = .81$) and behavioural intentions consisted of three items ($\alpha = .93$). (Refer to Table 1).

Table 1. Reliability coefficients for the five UTAUT constructs

Constructs	No. of Items	Composite Reliability
Performance Expectancy	4	0.85
Effort Expectancy	3	0.88
Social Factors	3	0.72
Facilitating Conditions	5	0.81
Behavioural Intentions	3	0.93

Results

Sample Profile

The students completing the survey ranged in age from 17 to 60 years with a mean of 26.2 (SD=9.3), with 64.0% of the sample being 25 years or younger. Seventy-two per cent of the undergraduate students participating in the survey were female; a close approximation to the 68% (5,123) in the actual undergraduate population. Just over one third (34.6%) of the students were in their first year of study, 29.5% in their second, 27.5% in their third and the remaining 8.5% have been pursuing their undergraduate degrees for at least four years. Table 2 presents the demographic profile of the sample.

Table 2. Demographic profile of sample

	Frequency (n)	**Percent (%)**
Gender	429	71.5
Female	171	28.5
Male		
Age		
Under 25 years	384	64.0
25 – 30 years	67	11.2
31 – 40 years	79	13.2
Over 40 years	70	11.6
Year of programme		
First		
Second	176	29.5
Third	164	27.5
Fourth	39	6.5
More than four years	11	1.8

Mobile Device Ownership

Cell phone ownership was extremely high among the Cave Hill undergraduate population, with 95.5% (573) of students having a cell phone. Interestingly, rates of ownership were similar across male (95.9%) and female (95.3%) students as well as the four age categories: under 25 years (95.3%), 25-30 years (95.5%), 31-40 years (94.9%) and over 40 years (97.1%). Adoption

of other mobile devices was significantly lower; with 25.5% owning MP3 players, 24.8% tablet devices, 15.8% eBook readers and 1.0% PDAs. In addition, over 45% of the students owned at least two different types of mobile devices. In the case of smartphones, three in four undergraduate students (76.6%) were owners. Ownership was higher among males (80.7%) than females (75.1%). In addition, students in the 25-30 years age group (83.6%) were far more likely to have smartphones than those in the under 25 (78.4%), 30 – 40 (73.4%) or the over-40 age groups (64.3%). Among the undergraduate population, Blackberry was the operating system of choice; with just over two thirds of this group (66.7%) owning a Blackberry phone. Smaller groups of students reported having an Android device (13.1%), iPhone (4.5%), Windows phone (1.0%) or some other type of smartphone (7.7%). With respect to smartphone features, the camera (87.5%), audio recorder (81.8%), video recorder (81.3%), WIFI (73.3%), Internet cable (72.7%), ability to install applications (62.0%), QWERTY (61.8%) were among the most popular features. These results are presented in Table 3.

Table 3. Mobile device ownership

	Frequency (n)	**Percent (%)**
Types of Mobile Devices		
Smart phone	460	76.6
MP3 Player	153	25.5
Tablet Device	149	24.8
Ebook Reader	95	15.8
PDA	6	1.0
Types of smartphones		
Android	75	13.1
Blackberry	307	53.6
iPhone	26	4.5
Windows Mobile Phone	6	1.0
Other Smart Phone	46	7.7
Don’t have a Smart Phone	113	18.8
Smartphone features		
Touch Screen	201	33.5
QWERTY	371	61.8
External Display	132	22.0
Internet Cable	436	72.7
WIFI	440	73.3
Camera	525	87.5
Audio recorder	491	81.8
Video recorder	488	81.3
Office Productivity Software	295	49.2
Ability to Install Applications	372	62.0

Examination of Constructs

Next the means and standard deviations for each of the items comprising the constructs, the five constructs as well as the correlations between the constructs were calculated (see Tables 4 and 5). A descriptive summary of the results is given below.

Performance Expectancy

Performance expectancy had a mean score of 3.81 (SD = 0.76). While the majority of students (90.0%) agreed that "Mobile Technologies are useful in education in general", only half of the sample felt that "Mobile technologies would improve students' performance" or that "Mobile technologies would increase students' productivity". The construct was significantly positively correlated with the behavioural intentions ($p < .01$ level), with a correlation of .51.

Effort Expectancy

This construct had the highest mean of 4.04 (SD = 0.65) indicating high agreement among students with statements such as "Mobile technologies are easy to use" and "Learning to operate mobile technology is easy". Over 80% of students agreed or strongly agreed with each of the three statements, revealing students' perceived ease of use of mobile technologies. The construct was significantly positively correlated with behavioural intentions ($p < .01$), with a correlation coefficient of .27.

Social Influence

This construct had the lowest mean of 3.16 (SD = 0.76). Overall, agreement to these three items was rather low, with fewer than 45% of students agreeing that influential persons in their lives believe they should be using mobile learning technologies. More specifically, only 30% believe that "People who influence my behaviour think that I should use mobile technologies" and 36% agreed that "People who are important to me think that I should use mobile technologies for learning." A slightly higher percentage (42%) believe that their "University lecturers are supportive of the use of mobile technologies". The construct was significantly positively correlated with behavioural intentions ($p < .01$), with a correlation coefficient of .40.

Facilitating Conditions

Facilitating conditions had a mean of 3.62 (SD = 0.71). It was interesting to note that students generally believe that they have both the knowledge (77%) and resources (67%) to use m-learning. However, there were lower levels of agreement when students were asked about the existence of infrastructural and policy support for m-learning in Barbados (59%) and at Cave Hill Campus (58%). The construct was significantly positively correlated with behavioural intention s ($p < .01$), with a correlation coefficient of .47.

Behavioural Intentions

In the study, students were asked about their intentions to use m-learning technologies in the near future. The construct had a mean of 3.76 (SD = 0.93). While most (70%) of the students plan to use the m-learning technologies at some point in the near future, they was some uncertainty as to whether their plans would materialize in the next semester (58%).

Table 4. Descriptive statistics for UTAUT items and constructs

	Mean	SD
Performance Expectancy		
Mobile technologies are useful in education in general.	4.26	0.71
Using mobile technologies enable students to accomplish tasks more quickly.	4.01	0.88
Mobile technologies would improve students' performance.	3.48	1.00
Mobile technologies would increase students' productivity.	3.49	1.04
	3.81	**0.76**
Effort Expectancy		
Mobile technologies are easy to use.	4.15	0.69
Finding or using features in mobile technologies is easy.	3.97	0.74
Learning to operate mobile technology is easy.	4.01	0.75
	4.04	**0.65**
Social Influence		
People who influence my behavior think I should use mobile technologies for learning.	3.03	0.94
People who are important to me think I should use mobile technologies for learning.	3.12	0.96
Lecturers are supportive of the use of mobile technologies.	3.31	0.94
	3.15	**0.75**
Facilitating Conditions		
In general, my University campus has support for m-learning.	3.61	0.94
In general, the country in which my university is located has support for m-learning.	3.57	0.94
I have the necessary resources to use m-learning.	3.68	0.98
I have the knowledge to use m-learning.	3.92	0.85
Support is available when problems are encountered with m-learning technologies.	3.30	0.98
	3.62	**.71**
Behavioural Intentions		
I intend to use m-learning strategies in the next semester.	3.74	0.986
I predict I will use m-learning technologies in my course in the next semester.	3.66	1.020
I have a plan to use m-learning technologies in the near future.	3.87	0.954
	3.76	**0.93**

Table 5. Correlations among the UTAUT constructs

Constructs	PE	EE	SF	FC	BI
PE	—	.236**	.452**	.369**	.507**
EE		—	.068	.194**	.274**
SF			—	.356**	.399**
FC				—	.471**
BI					—

Note: **Correlation is significant at the 0.01 level (two-tailed).
PE, performance expectancy; EE, effort expectancy; SF, social factors; FC, facilitating conditions; BI, behavioural intentions.

Multiple Regression

A multiple linear regression model was developed for predicting behavioural intentions from the four UTAUT constructs. In the first phase of the regression, a baseline model was run without the presence of the moderating variables, gender and age. The resulting model was statistically significant ($F(4, 595) = 92.42$, $p < .001$), and accounted for 38% of the variance in behavioural intentions. All four predictors had significant positive effects on students' intentions to use m-learning technologies. An examination of the standardized beta weights indicates that the greatest contributors to the prediction model were performance expectancy ($\beta = 0.30$, $p < 0.001$) and facilitating conditions ($\beta = .28$, $p < 0.001$). In addition, there were no multicollinearity problems since the VIFs for the constructs ranged in value from 1.08 to 1.39.The regression coefficients without moderating effects are shown in Table 6.

Table 6. Summary of multiple regression for variables predicting behavioural intentions (without moderating effects)

	B	SE (B)	β	t	Sig. (p)
Performance Expectancy	.368	.046	.303	7.96	.000
Effort Expectancy	.197	.047	.139	4.142	.000
Social Influence	.189	.046	.154	4.139	.000
Facilitating Conditions	.361	.047	.277	7.720	.000

Note. $R^2 = .38$

Next, a second regression was run in which the moderating influences of age and gender were examined. To test these effects, the moderators (age and gender) and their interactions with the four independent constructs were added to the model. The first step in this analysis was to create new group-centred variables based on five quantitative variables (i.e., PE, EE, SI, FC and Age). Next cross-product terms were created between the group-centred constructs and the moderator variables to represent the interaction effects. Finally, the regression model was created hierarchically with the group-mean centred variables added in the first level and the interaction terms in the second level.

The results indicated that the predictive power of the model was not significantly improved with the inclusion of the moderating variables. Of the eight interaction effects, only the influence of performance expectancy on behavioural intentions was significantly moderated by age ($p < .05$). An examination of the simple slopes showed that the effect decreased with age; the relationship being stronger for younger undergraduates. Gender had no significant moderating effect on any of the relationships. With respect to main effects, only effort expectancy ($\beta = 0.22$, $p< 0.05$) and facilitating conditions ($\beta = 0.24$, $p < 0.05$) were both significant predictors of behavioural intentions. However, when the moderating variables and interactions entered in the model, social influence was no longer a significant predictor ($\beta = 0.05$, $p > 0.05$) (See Table 7).

Table 7. Summary of multiple regression for variables predicting behavioural intentions (with moderating effects)

	β	t	Sig. (p)
Performance Expectancy (PE)	.260	2.275	.023*
Effort Expectancy (EE)	.222	2.155	.032*
Social Influence (SI)	.050	.447	.655
Facilitating Conditions (FC)	.238	2.183	.029*
Age	-.076	-2.182	.030*
Gender	.003	.094	.925
PE x Age	-.078	-2.000	.046*
EE x Age	.050	1.315	.189
SI x Age	.032	.877	.381
FC x Age	.055	1.504	.113
PE x Gender	.043	.369	.712
EE x Gender	-.119	-1.160	.247
SI x Gender	.110	.993	.321
FC x Gender	.053	.471	.638

Note. $R^2 = .38$, $p<0.05$

Discussion and Conclusion

The primary purpose of this study was to use the UTAUT model to investigate the factors that significantly impact Campus Hill Campus' undergraduate student population to adopt m-learning. Overall, a high level of mobile device ownership was found among the students, rivalling that of the USA. Findings from the 2013 Pew Internet survey revealed comparable penetration rates for mobile devices among adults in the US. For example, as of May 2013, 91% and 56% owned cellular and smartphones as compared with 95% and 77% respectively among the Cave Hill's undergraduate population. In addition, a sizeable proportion was likely to have at least two mobile devices in their "digital backpacks." This is in keeping with the rapid information and communication technology (ICT) adopter trends among undergraduate population as reported in previous research studies (Millea, Green, & Putland, 2005; Oblinger & Oblinger, 2005). Cognizant of this, lecturers must work to revamp their pedagogical models to

leverage this reality and embrace the technological know-how of this Generation Z and Net Generation cohort.

With respect to the UTAUT constructs, the results confirmed that there were several factors influencing students' proclivity to use m-learning. Overall, the regression model explained 38% of the variance in students' behavioural intentions and provided partial support for the UTAUT model. More specifically, the results revealed that:

- Consistent with previous research, performance expectancy was the strongest predictor of behavioural intentions (Kijsanayotin, Pannarunothai, & Speedie, 2009; Wang, Wu & Wang, 2009). Furthermore, it was found that age moderated the effect of performance expectancy on behavioural intentions; with the relationship being stronger for younger students. This result which agreed with the findings of Morris & Venkatesh (2000), Venkatesh & Morris (2000) and Venkatesh et al. (2003) indicate that for students to buy into the concept of integrating m-learning technology in their classes, they must first be convinced of its utility and its productivity, particularly younger users of the technology.
- Effort expectancy had a positive direct effect on the students' intentions to use m-learning technologies. This finding which supports that of previous research (Venkatesh& Morris (2000) and Venkatesh et al. (2003) reiterates that students are more inclined to adopt the new technology when they know they have the necessary skills and believe the mobile devices and technologies are easy to use. Therefore Wang, Wu and Wang (2009) suggest that it is important that m-learning systems be designed to be user friendly with easy to use.
- Unlike previous research, (Brown & Venkatesh, 2005; Venkatesh et al., 2003; Venkatesh &Davis, 2000) social influence was not found to be a significant determinant of students' intentions to adopt m-learning. However, given this population of educated, independent thinkers, it is quite likely that the students have acquired enough experience to feel comfortable and confident using the mobile technology, and as a result, the opinions of peers have little effect on their m-learning adoption decisions. This view was supported by Burton-Jones & Hubona, (2006) and Al-Qeisi (2009) who argue that as education and experience increase, users become more empowered and this in turn decreases the effect of social influence on their behaviour.
- Facilitating conditions had a strong positive influence on undergraduate students' intentions to use m-learning technologies, that is, students are more likely to use m-learning if they believe that there is adequate availability of and easy access to organizational and technical resources to support the use of the m-learning system. The original UTAUT model hypothesized that when performance expectancy and effort expectancy constructs are present, facilitating conditions will not have a direct influence on behavioural intentions (Venkatesh et al., 2003). However, other studies have reported a significant effect (Tibenderana et al., 2010; Wang et al., 2010; Wu at al., 2009; Zhou, 2008). Therefore, although the undergraduate students are confident in their ability to use the m-learning technologies, they need to be convinced of the University's and the host country's (i.e., Barbados') support for and commitment to the initiative. Given the slow pace and the challenges which developing countries face in providing the necessary technical and infrastructural enabling environment, it is therefore not surprising that students need that reassurance from the relevant authorities before fully embracing the possibility. In researching the adoption of e-government services in Pakistan, Ahmad, Markkula and Oivo (2013) found that having adequate facilitating conditions is one of

the greatest challenges to technologies advances in developing countries. To mitigate this situation, the researchers stress that it is important that the authorities formulate policies and campaigns pledging their support of the technological initiatives and publicly articulate their plans for moving from a vision to reality (Ahmad, Markkula & Oivo, 2013).

- No significant gender differences were found when modelling the relationships of the four key constructs on behavioural intentions. This means that the significant positive effects for performance expectancy, effort expectancy and facilitating conditions were consistent in size and direction for both male and female undergraduate students. Again, given the nature of the population, this is not a surprising finding. This suggests that the gender gap with respect to technology acceptance is lessening; a finding supported by other researchers who have conducted technology acceptance among student populations (Letchumanan & Tarmizi, 2011; Maldonado et al., 2011; Marchewka, Liu, & Kostiwa, 2007).
- With the exception of performance expectancy, age did not affect any of the other relationships. While this finding is inconsistent with that of the original research (Venkatesh et al., 2003), the nature of the population may account for this occurrence. Given that three quarters of the sample was under 30 years of age, this high level of homogeneity is likely responsible for muting the moderating effect of age.

Implications for Future Research

While this research will add to the discussion on m-learning acceptance in higher education institutions, there are some areas which could be investigated in future studies. First, this study focused solely on the views of the student population. However, the success of any m- learning initiative is highly dependent on the university educators as well. Therefore, future work will incorporate the acceptance perceptions of the university lecturers, who are ultimately responsible for the design and delivery of the courses. Second, the Cave Hill Campus is one of three campuses of the University of the West Indies. Therefore it would be instructive to explore and compare whether students in the other two campuses are influenced similarly by the factors explaining their intentions to use m-learning technologies. Third, m-learning applications are still at an ascent stage of development within the region, therefore it may be challenging for students to visualize exactly how they can be integrated within the traditional modes of delivery. Hence, a second round of surveys is warranted. This should take place after the technologies have gained traction and public discussions among the key stakeholders about the benefits and challenges of m-learning for education delivery, both from an implementation and pedagogical perspective, have been convened.

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